

# DRUG DISCOVERY

## Discovery of novel vaccine for Malaria

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**M**alaria represents a global public health problem that hinders socio-economic development in vast regions of the world, particularly of the planet's Tropical and sub-Tropical areas. It is a disease induced by parasites of the *Plasmodium* genus, which are transmitted by *Anopheles* mosquitoes and represents a great socio-economic burden Worldwide. *Plasmodium vivax* is the second species of malaria Worldwide, but it is the most prevalent in Latin America and other regions of the planet. It is currently considered that vaccines represent a cost-effective strategy for controlling transmissible diseases and could complement other malaria control measures; however, the chemical and immunological complexity of the parasite has hindered development of effective vaccines. The burden due to malaria keeps increasing because of the spread of drug resistant parasites and insecticide resistant mosquito vectors. Therefore, there is an urgent need for the discovery of new malaria vaccines and drugs. To find novel malaria vaccine candidates, we need to synthesize, screen, and characterize quality malarial proteins. However, conventional recombinant protein expression methods, such as *E. coli* based system, are inefficient in expressing highly AT-rich malaria genes into quality proteins. Biochemical, immunocytochemical, and biological analyses have revealed that the recombinant malaria proteins synthesized are of high quality and therefore amenable for the assessment and discovery of potential vaccine targets. A candidate malaria vaccine is safe and protects against infection in adults, according to the results of an early-stage clinical trial.

Scientists from Singapore's Nanyang Technological University (NTU) have discovered a key process during the invasion of the blood cell by the Malaria parasite, and found a way to block this invasion. According to the World Health Organisation, about 3.3 billion people are at risk of Malaria. This mosquito-borne disease causes fever and headache and in serious cases, can cause a patient to go into a coma or result in death. The disease infected about 219 million people in 2010, and kills around 860,000 people worldwide annually. If there can be a low-cost vaccine which is effective in rendering the parasite harmless, then millions of lives can be saved and this will also benefit the economy by millions of dollars each year. To prevent this invasion, Prof Preiser's research team developed antibodies which can interfere with this invasion process. The team outcome was made possible with the development of a new screening assay that allows the rapid characterization of parasite signalling, which is significantly faster than conventional methods.

The newly invented technique utilises a high-throughput fluorescence scanning approach if antibodies or drugs fail to prevent the invasion of the red blood cell by the malaria parasites, the sample will light up. If the antibodies work, then the sample remains dark. This allows for rapid characterisation of thousands of compounds as well as antibodies for their ability to interfere with the invasion process. The NTU team will be using their new technique to identify other antibodies which can target the different components of the Malaria parasite, and potentially lead to future treatment and vaccine breakthroughs for the fatal Malaria disease. They are also looking to collaborate with industry partners to develop new vaccines based on their latest discoveries. Scientists and health care providers have made significant gains in characterizing, treating and preventing malaria; however, a vaccine has remained an elusive goal. Several follow-up studies are now planned.

They include exploring how long protection lasts and whether the vaccine could protect against other strains of *P. falciparum*. Among the future challenges is that this vaccine must be injected intravenously - a rare delivery route for vaccines and stored in liquid nitrogen. This would require new infrastructure, especially in rural, developing regions where the vaccine would be most needed.

## REFERENCE

1. Xiaohong Gao, Karthigayan Gunalan, Sally Shu Lin Yap, Peter R. Preiser. Triggers of key calcium signals during erythrocyte invasion by Plasmodium falciparum. *Nature Communications*, 2013; 4 DOI: 10.1038/ncomms3862